What is claimed is:

1. A motor driven compressor for compressing a gaseous medium comprising:

a compressor housing;

a rotating assembly mounted for rotation about an axis within the housing, and having;

a) an impeller forming part of a compressor stage within the housing; and

b) a motor rotor forming an armature of a motor for driving the rotating assembly about the axis, the motor rotor including a permanent magnet and being encapsulated by a sleeve press-fit over the permanent magnet with end caps connected to the sleeve.

2. A motor driven compressor as defined in Claim 1 wherein a motor stator is mounted in stationary relationship within the compressor housing relative to the motor rotor and is surrounded by a cooling jacket.

3. A motor driven compressor as defined in Claim 2 wherein the cooling jacket surrounding the motor stator is gas cooled.

4. A motor driven compressor as defined in Claim 2 wherein the cooling jacket surrounding the motor stator is liquid cooled.

5. A motor driven compressor as defined in Claim 4 wherein the cooling jacket defines a corkscrew-shaped cooling path for a liquid.

6. A motor driven compressor as defined in Claim 1 wherein the rotating assembly further includes two journal bearing shafts disposed along the axis of the assembly at opposite sides of the motor rotor and coupled with the end caps of the motor rotor.

7. A motor driven compressor as defined in Claim 6 wherein the rotating assembly further includes a tie rod extending along the axis of the assembly and holding the impeller, the motor rotor and the two journal bearings together under a pre-load.

8. A motor driven compressor for compressing a gaseous medium comprising:

a compressor housing;

a rotating assembly mounted for rotation about an axis within the housing, and having;

a) an impeller forming part of a compressor stage within the housing;

b) a motor rotor forming an armature of a motor for driving the rotating assembly about the axis;

c) two journal bearing shafts disposed along the axis at opposite sides of the motor rotor; and

d) a tie rod extending along the axis of rotation and holding the impeller, the motor rotor and the two journal bearings under preload.

9. A motor driven compressor for compressing a gaseous medium as defined in Claim 8 further including a thrust load balancing disk counterbalancing the axial thrust of the impeller along with axis within the housing, and the thrust load balancing disk also being held under a preload by the tie rod.

10. A motor driven compressor for compressing a gaseous medium comprising:

a compressor housing;

a rotating assembly mounted for rotation about an axis within the housing, and having;

a) an impeller forming part of a compressor stage within the housing;

b) a motor rotor forming an armature of a motor for driving the rotating assembly about the axis;

c) two journal bearing shafts;

d) a thrust load balancing disk to balance an axial load of the impeller along the axis within the housing; and

e) a thrust bearing disk;

first and second journal bearings also mounted in the housing supporting the rotating assembly at the journal bearing shafts respectively for rotation of the rotor assembly within the housing and a thrust bearing mounted in the housing cooperating with the thrust bearing disk

whereby the journal bearings and the thrust bearings establish and maintain both the radial and axial position of the rotating assembly within the housing.

11. A motor driven compressor for compressing a gaseous medium as defined in Claim 10 wherein the journal bearings are oil-less foil gas bearings mounted in the compressor housing and cooperating with the journal bearings of the rotating assembly.

12. A motor driven compressor for compressing a gaseous medium as defined in Claim 10 wherein the thrust bearings are oil-less foil gas bearings mounted in the compressor housing and cooperating with the thrust bearing disk of the rotating assembly.

13. A motor driven compressor as defined in Claim 10 wherein the thrust load balancing disk comprises a disk attached to the rotating assembly and having a gas pressure seal at its periphery.

14. A motor driven compressor for compressing a gaseous medium comprising:

a compressor housing defining an inlet for the gaseous medium;

a rotating assembly mounted for rotation about an axis within the housing, and having;

a) an impeller forming part of a compressor stage receiving the gaseous medium from the inlet within the housing;

b) a motor rotor forming an armature of a motor for driving the rotating assembly about the axis;

c) two journal bearing shafts; and

first and second journal bearings in the housing supporting the rotating assembly at the journal bearing shaft for rotation within the housing, and

cooling ducts deriving bleed gas from the impeller and extending through the rotating assembly and the journal bearings for cooling the compressor by means of the gaseous medium.

15. A motor driven compressor as defined in Claim 14 wherein the cooling ducts extend from the rotating assembly and journal bearings back to the inlet in the compressor housing.

16. A motor driven compressor as defined in Claim 14 wherein:

the impeller is mounted at one axial end of the rotating assembly and a thrust load balancing disk is mounted at the other axial end of the rotating assembly to balance thrust loads generated by the impeller, and the cooling ducts lead to and apply the bleed gas to the thrust balancing disk.

17. A centrifugal compressor for compressing a gaseous medium comprising:

a compressor housing;

a rotating compressor assembly mounted for rotation about an axis within the housing, and having an impeller forming part of a compressor stage;

wherein the compressor housing includes a two-piece volute receiving the gaseous medium discharged from the impeller, the volute having a passageway of rectangular cross-section through which the compressed gaseous medium flows from the impeller.

18. A centrifugal compressor as defined in Claim 17 wherein a plurality of airfoil-shaped diffusers are disposed in the passageway of the volute near a discharge region of the impeller.

19. A centrifugal compressor for compressing a gaseous medium comprising:

a compressor housing defining an inlet for the gaseous medium;

a rotating compressor assembly including an impeller mounted in the housing with the impeller disposed adjacent the housing inlet;

the compressor housing also including a volute defining a discharge path leading from the discharge of the impeller for the gaseous medium; and

a plurality of airfoil-shaped diffusers disposed in the discharge path adjacent the discharge of the impeller for guiding the flow of the gaseous medium discharged from the impeller.

20. A centrifugal compressor for compressing a gaseous medium as defined in Claim 19 wherein the housing is a two-piece housing and the discharge path in the volute has a rectangular cross section.

21. A motor-driven centrifugal compressor for compressing a gaseous medium comprising:

a compressor housing;

a rotating assembly mounted for rotation about an axis within the housing and including an impeller and a motor rotor coupled with the impeller for rotation about the axis;

a motor stator mounted in the compressor housing in stationary relationship with respect to the motor rotor;

the rotating assembly also extending to a position exterior to the compressor housing; and

a commutating element mounted on the exterior of the housing for controlling the excitation of the motor stator.

22. A motor driven compressor as defined in Claim 18 wherein the commutating element includes a Hall sensor, and the rotating assembly includes a magnet detected by the Hall sensor.